Cisco CRS-1 Carrier Routing System Fiber-Optic Cleaning Guide

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Cisco CRS-1 Carrier Routing System Fiber-Optic Cleaning Guide
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CONTENTS

Preface v

Objective v

Audience v

Document Organization vi

Document Conventions vi

Related Cisco CRS-1 Documentation vii

Hardware Documents vii

Software Documents vii

Changes to This Document vii

Obtaining Documentation vii

Cisco.com viii

Product Documentation DVD viii

Ordering Documentation viii

Documentation Feedback viii

Cisco Product Security Overview ix

Reporting Security Problems in Cisco Products ix

Obtaining Technical Assistance x

Cisco Technical Support & Documentation Website x

Submitting a Service Request x

Definitions of Service Request Severity xi

Obtaining Additional Publications and Information xi

CHAPTER 1 **Overview** 1-1

Inspection and Cleaning 1-1

General Reminders and Warnings 1-2

Fiber-Optic Connectors in a Multishelf System 1-2

About the Cisco CRS-1 Fiber-Optic Cleaning Kit 1-5

Contents of the Cleaning Kit 1-5

Description of the Fujikura IBC Cleaning Tool 1-7

Using the Fujikura IBC Cleaning Tool 1-9

CHAPTER 2 **Cleaning the Optical Array Cable Connectors** 2-1

Information About Cleaning the Optical Array Cable Connectors 2-1

How to Clean the Optical Array Cable Connectors 2-2

CHAPTER 3 **Cleaning the Bulkhead Array Connectors 3-1**

Information About Cleaning the Bulkead Array Connectors 3-1

How to Clean the Bulkhead Array Connectors 3-2

CHAPTER 4 **Cleaning the S2 HBMT Connectors 4-1**

Information About Cleaning the S2 HBMT Connectors 4-1

Cleaning the S2 HBMT Connectors 4-2

CHAPTER 5 **Cleaning the OIM HBMT Connectors 5-1**

Information About Cleaning the OIM HBMT Connectors 5-1

How to Clean the OIM HBMT Connectors 5-2

INDEX

Preface

This guide describes how to clean all multiferrule (MT) optics in a Cisco CRS-1 Carrier Routing System Multishelf System using the Cisco CRS-1 fiber-optic cleaning kit. This kit cleans all optics on the S2 module, S13 module, optical interface module (OIM), and optical array cables.

The preface contains the following sections:

- Objective
- Audience
- Document Organization
- Document Conventions
- Related Cisco CRS-1 Documentation
- Changes to This Document
- Obtaining Documentation
- Documentation Feedback
- Cisco Product Security Overview
- Obtaining Technical Assistance
- Obtaining Additional Publications and Information

Objective

This guide provides instructions for properly cleaning dust and contaminates from the fiber-optic connections in a Cisco CRS-1 multishelf router. All connections must be clean because even microscopic particles can cause failure of the component or entire system.

Audience

This guide is intended for service personnel, field service technicians, and hardware installers who will be cleaning the fiber-optic connections.

Document Organization

This guide contains the following chapters and appendixes:

- Chapter 1, "Overview," provides an overview of the fiber-optic connections in the Cisco CRS-1 multishelf system. This chapter also summarizes the process for cleaning the connections and includes an overview of the Cisco CRS-1 fiber-optic cleaning kit.
- Chapter 2, "Cleaning the Optical Array Cable Connectors," provides instructions for cleaning the ferrules in the optical array cable connectors. These connectors are at both ends of the fiber-optic cables that connect the S13 cards in the line card chassis to the OIMs in the fabric card chassis.
- Chapter 3, "Cleaning the Bulkhead Array Connectors," provides instructions for cleaning the optical array connectors located on the S13 cards in the line card chassis to the OIMs in the fabric card chassis.
- Chapter 4, "Cleaning the S2 HBMT Connectors," provides instructions for cleaning the high-density backplane-mounted (HBMT) connectors on the rear of the S2 cards in the fabric card chassis.
- Chapter 5, "Cleaning the OIM HBMT Connectors," provides instructions for cleaning the HBMT connectors on the rear of the OIMs in the fabric card chassis.

Document Conventions

This guide uses the following conventions:

Caution Means *reader be careful*. You are capable of doing something that might result in equipment damage or loss of data.

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Warning **This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.** Statement 1074

See *Regulatory Compliance and Safety Information for the Cisco CRS-1 Carrier Routing System* for translations of warnings and information about the compliance and safety standards with which the Cisco CRS-1 router conforms.

Related Cisco CRS-1 Documentation

For complete planning, installation, and configuration information, see the documents in this section. Cisco CRS-1 product documentation is available online at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/core/crs/index.htm

Hardware Documents

The Cisco CRS-1 multishelf System hardware documentation consists of:

- *Cisco CRS-1 Carrier Routing System Fabric Card Chassis Site Planning Guide*
- *Cisco CRS-1 Carrier Routing System Multishelf System Site Planning Guide*
- *Cisco CRS-1 Carrier Routing System Multishelf System Description*
- *Cisco CRS-1 Carrier Routing System Fabric Card Chassis Unpacking Guide*
- *Cisco CRS-1 Carrier Routing System Fabric Card Chassis Installation Guide*
- *Cisco CRS-1 Carrier Routing System Multishelf System Interconnection and Cabling Guide*
- *Regulatory Compliance and Safety Information for the Cisco CRS-1 Carrier Routing System*
- *Cisco CRS-1 Carrier Routing System Hardware Documentation Guide*

Documentation for the Cisco Catalyst 6509 Switch is available online at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/6000hw/index.htm

Software Documents

For a complete listing of software documentation available for the Cisco CRS-1 router, see *About Cisco IOS XR Software Documentation*, available online at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/iosxr3/xr3about.htm

Changes to This Document

Table 1 lists the technical changes made to this document since it was first printed.

Table 1 Document Change History

Revision	Date	Change Summary
OL-8179-01	June 2006	Information about OIM HBMT adapter was added to Chapter 5.
OL-8179-01	August 2005	Initial release of the document.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/techsupport

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

The Product Documentation DVD is a comprehensive library of technical product documentation on a portable medium. The DVD enables you to access multiple versions of installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the same HTML documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .PDF versions of the documentation available.

The Product Documentation DVD is available as a single unit or as a subscription. Registered Cisco.com users (Cisco direct customers) can order a Product Documentation DVD (product number DOC-DOCDVD= or DOC-DOCDVD=SUB) from Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Ordering Documentation

Registered Cisco.com users may order Cisco documentation at the Product Documentation Store in the Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Nonregistered Cisco.com users can order technical documentation from 8:00 a.m. to 5:00 p.m. (0800 to 1700) PDT by calling 1 866 463-3487 in the United States and Canada, or elsewhere by calling 011 408 519-5055. You can also order documentation by e-mail at tech-doc-store-mkpl@external.cisco.com or by fax at 1 408 519-5001 in the United States and Canada, or elsewhere at 011 408 519-5001.

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Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories, security notices, and security responses for Cisco products is available at this URL:

http://www.cisco.com/go/psirt

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you have identified a vulnerability in a Cisco product, contact PSIRT:

- For Emergencies only—security-alert@cisco.com

  An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.
- For Nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

Tip We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.*x* through 9.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT at the aforementioned e-mail addresses or phone numbers before sending any sensitive material to find other means of encrypting the data.

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support & Documentation Website

The Cisco Technical Support & Documentation website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, at this URL:

http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is down, or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of the network is impaired, while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco offerings. To order and find out more about the Cisco Product Quick Reference Guide, go to this URL:

  http://www.cisco.com/go/guide

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

  or view the digital edition at this URL:

  http://ciscoiq.texterity.com/ciscoiq/sample/

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

  http://www.cisco.com/en/US/products/index.html

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

  http://www.cisco.com/discuss/networking

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

Overview

The Cisco CRS-1 fiber-optic cleaning kit is used to clean all multiferrule (MT) optics in a Cisco CRS-1 Carrier Routing System Multishelf System using the Cisco CRS-1 fiber-optic cleaning kit. This kit cleans all optics on the S2 module, S13 module, optical interface module (OIM), and optical array cables.

The cleaning tool included in the kit advances a continuous roll of lint-free cleaning cloth across the face of the optic. The adapters included in the kit ensure that the cleaning tool is inserted at the proper angle and depth. Follow all instructions carefully to ensure that each optical connector is clean and free of all contaminants. This chapter provides an overview of the fiber-optic connections in the Cisco CRS-1 multishelf system; be sure to review it carefully before you begin cleaning your fiber-optic connectors.

This chapter presents the following topics:

- Inspection and Cleaning, page 1-1
- General Reminders and Warnings, page 1-2
- Fiber-Optic Connectors in a Multishelf System, page 1-2
- About the Cisco CRS-1 Fiber-Optic Cleaning Kit, page 1-5
- Using the Fujikura IBC Cleaning Tool, page 1-9

Inspection and Cleaning

Fiber-optic connectors must be properly cleaned to eliminate any dust or contamination. Even microscopic dust particles can cause failure of a component or the whole system. In addition to dust, other contaminants, such as oils (frequently from human hands), film residues (condensed from vapors in the air), and powdery coatings (left after water or other solvents evaporate), must be cleaned from the end face. These contaminants can be more difficult to remove than dust particles and can also cause damage to equipment if not removed.

All these contaminants are cleaned using the Cisco CRS-1 fiber-optic cleaning kit, as described in this guide.

Caution Use extreme care when removing or installing connectors so that you do not damage the connector housing or scratch the end face of the fiber. Always install protective covers on unused or disconnected components to prevent contamination. Always clean fiber connectors before installing them.

General Reminders and Warnings

Review these reminders and warnings before inspecting and cleaning your fiber-optic connections.

Warning **Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.** Statement 125

Warning **Class 1M laser radiation when open. Do not view directly with optical instruments.** Statement 281

Warning **Laser radiation. Do not view directly with optical instruments. Class 1M laser product.** Statement 283

Warning **For diverging beams, viewing the laser output with certain optical instruments within a distance of 100 mm may pose an eye hazard. For collimated beams, viewing the laser output with certain optical instruments designed for use at a distance may pose an eye hazard.** Statement 282

- Never touch the end face of the fiber connectors.
- Always inspect the connectors and adapters before you clean and before you make a connection.
  - Always turn off any laser sources before you inspect fiber connectors, optical components, and bulkheads. Never look into a fiber while the system lasers are on. Never connect a fiber to a fiberscope while the system lasers are on.
  - Always make sure that the cable is disconnected at both ends or that the card or pluggable receiver is removed from the chassis.
  - Never use unfiltered handheld magnifiers and focusing optics to inspect fiber connectors.
  - Always wear the appropriate safety glasses when required in your area. Be sure that any laser safety glasses meet federal and state regulations and are matched to the lasers used within your environment.
- Always keep a protective cap on unplugged fiber connectors.
  - Always store unused protective caps in a resealable container to prevent the possibility of transferring dust to the fiber. Locate the containers near the connectors for easy access.

Fiber-Optic Connectors in a Multishelf System

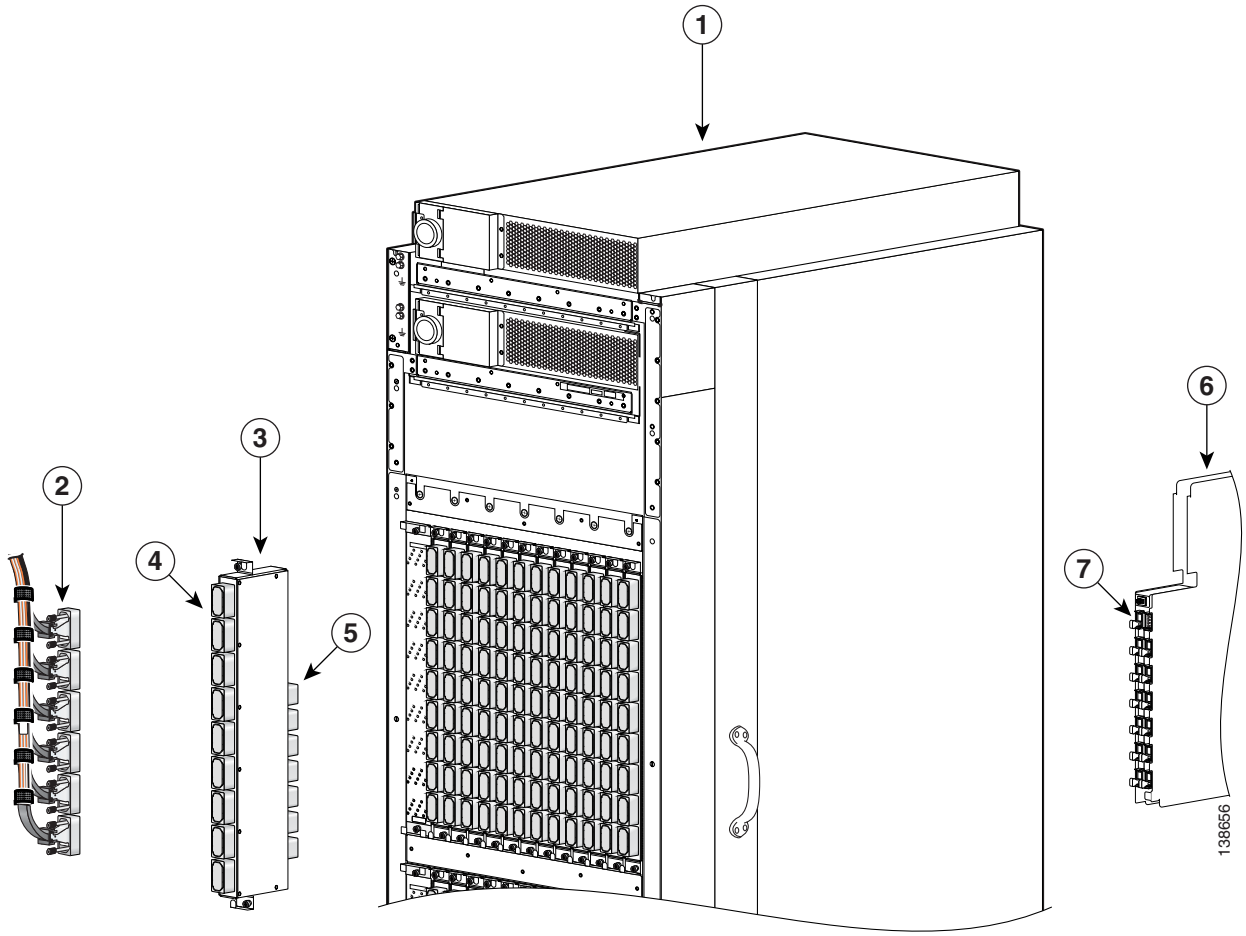
The Cisco CRS-1 fiber-optic cleaning kit cleans all multiferrule (MT) optics in the Cisco CRS-1 router, which is shown in Figure 1-1 and Figure 1-2. In a multishelf system, the connection points include:

- Optical array cable connectors: the connectors on the end of each fiber optic cable. These cables connect the S13 fabric cards in the line card chassis (LCC) to the OIMs in the fabic card chassis (FCC).
- Bulkhead array connectors: the optical connections on S13 fabric cards in the LCC and OIMs on the fabric card chassis (FCC).

- High-density backplane-mounted (HBMT) connectors: the optical connectors on the back of the S2 and OIMs. These connectors provide the optical path between an S2 card and its corresponding OIM.

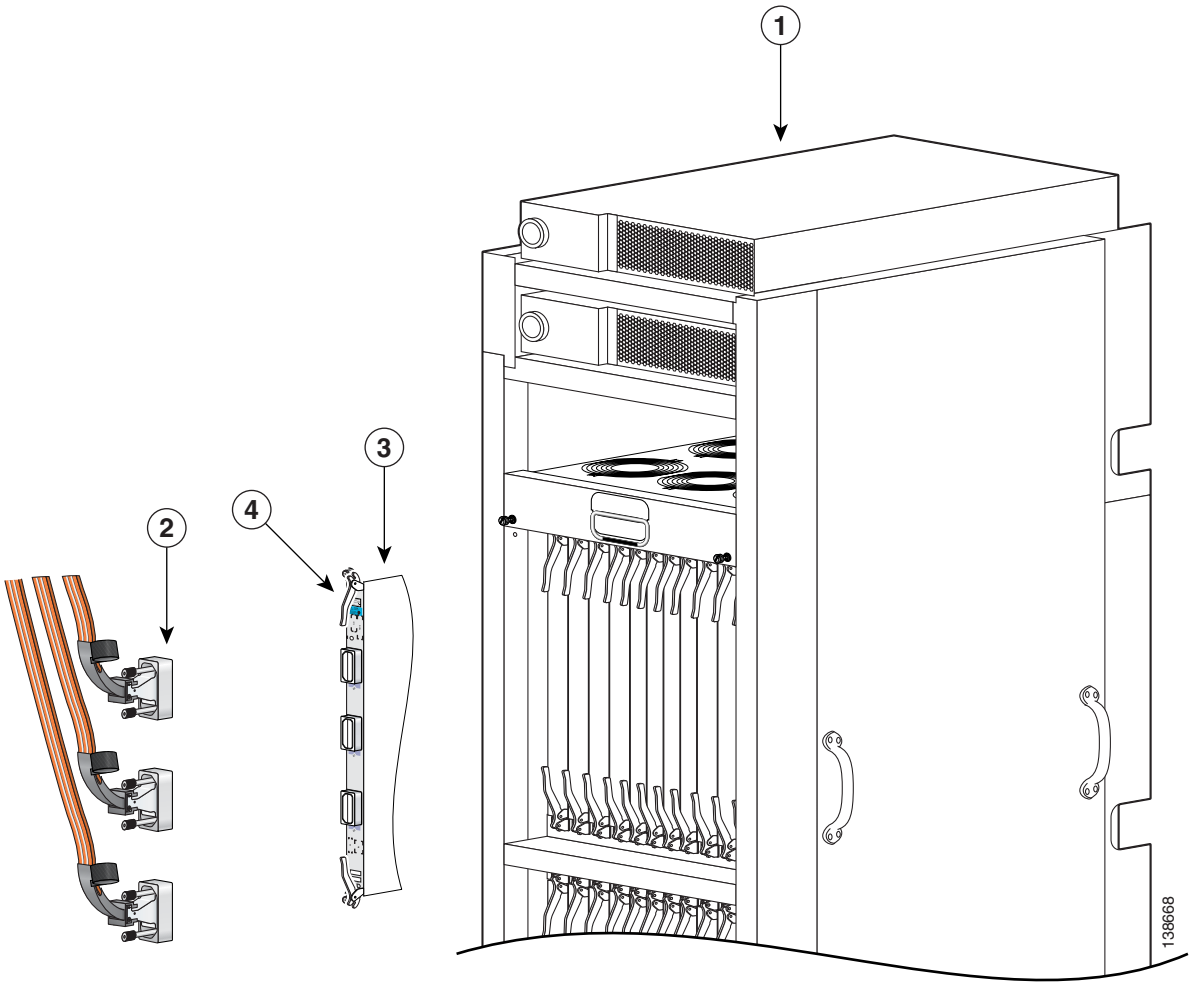
Figure 1-1 shows the fiber-optic connections in an FCC. Figure 1-2 shows the fiber-optic connections in an LCC.

Figure 1-1 Fiber-Optic Connections in an FCC (Rear View of Chassis)F



1	Fabric card chassis	**3**	Optical interface module (OIM)	**5**	OIM HBMT connectors	**7**	S2 HBMT connectors
2	Optical array cable connectors	**4**	OIM bulkhead array connectors	**6**	S2 switch fabric card (SFC)		

Figure 1-2 Fiber-Optic Connections in an LCC (Rear View of Chassis)



1	Line card chassis	**3**	S13 fabric card (FC/M)
2	Optical array cable connectors	**4**	S13 bulkhead array adapters

About the Cisco CRS-1 Fiber-Optic Cleaning Kit

All optical connections in a multishelf system are cleaned using the Cisco CRS-1 fiber-optic cleaning kit. This kit includes a tool that advances a lint-free cloth across the optical surface to remove any contaminants. The cleaning kit also includes an adapter for each connector type. The adapter ensures that the cleaning tool is inserted at the correct angle and depth for cleaning.

This section presents the following topics:

- Contents of the Cleaning Kit
- Description of the Fujikura IBC Cleaning Tool

Contents of the Cleaning Kit

The Cisco CRS-1 fiber-optic cleaning kit includes the following items:

- Fujikura IBC (in bulkhead cleaner) cleaning tool (see Figure 1-3)
- OIM/S13 array adapter (see Figure 1-4)
- S2 HBMT adapter (see Figure 1-5)
- OIM HBMT adapter (see Figure 1-6)

Figure 1-3 Fujikura IBC Cleaning Tool and Clear Protective Cap

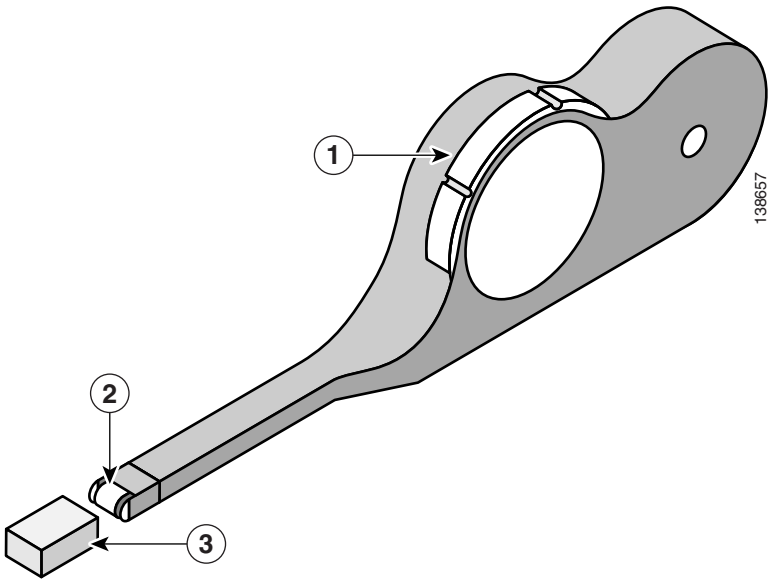


Figure 1-4 OIM/S13 Array Adapter

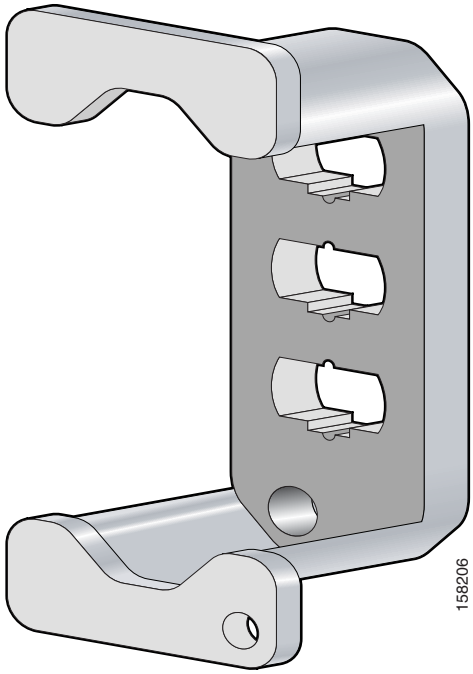


Figure 1-5 S2 HBMT Adapter

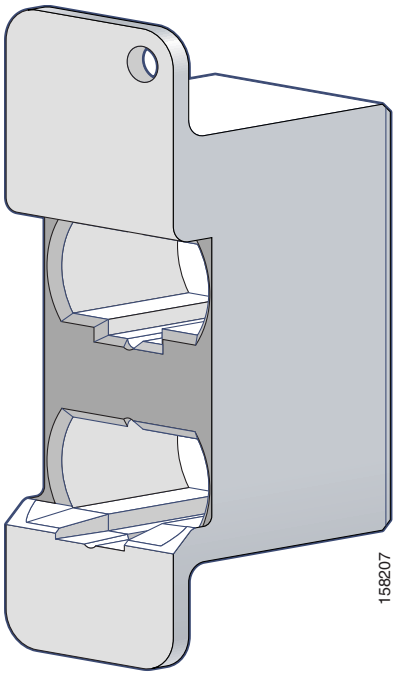
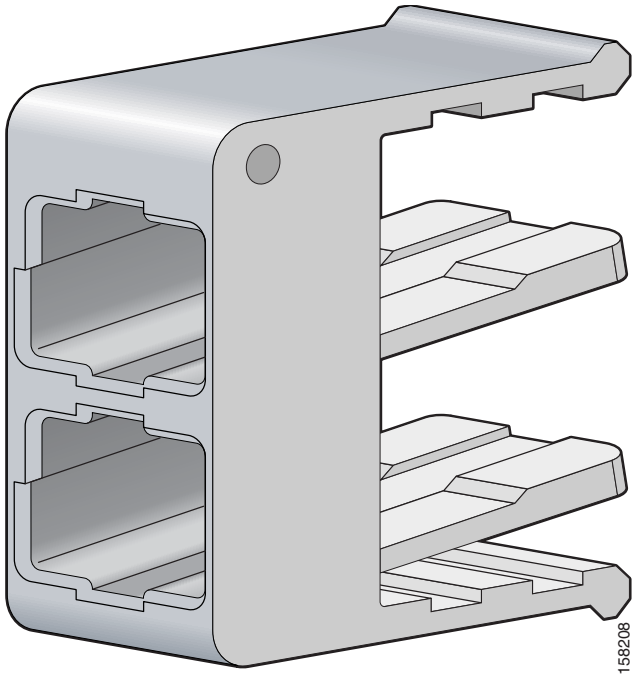


Figure 1-6 OIM HBMT Adapter

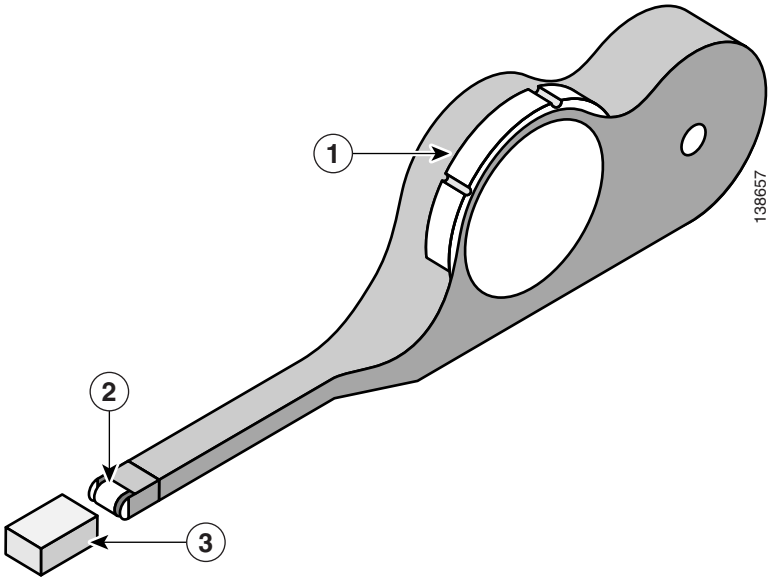


Description of the Fujikura IBC Cleaning Tool

Use the Fujikura IBC cleaning tool (see Figure 1-7) to clean the ferrules of your fiber optic connectors.

Note Be sure to replace the protective cap after each use of the cleaning tool.

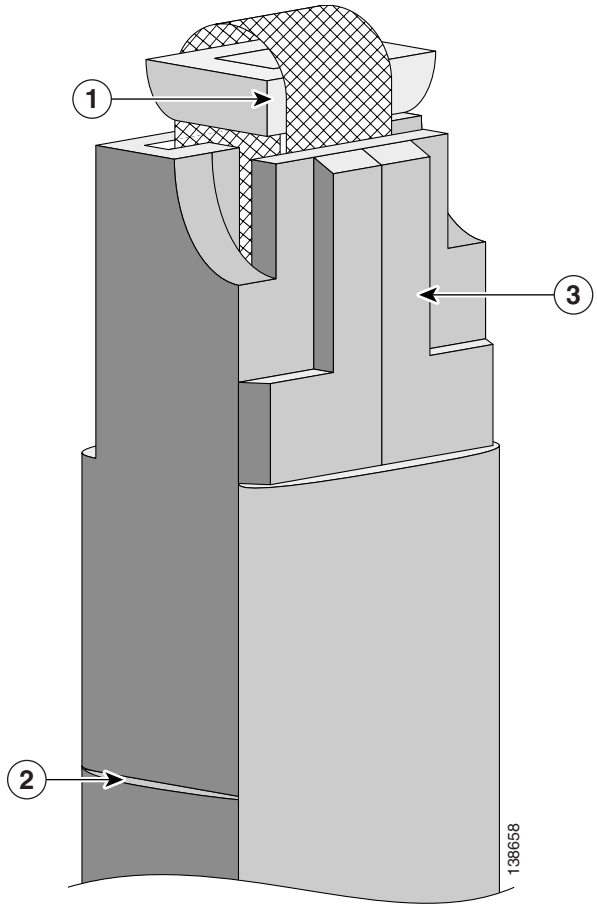
Figure 1-7 Fujikura IBC Cleaning Tool and Clear Protective Cap



1	Thumb wheel	**3**	Protective cap
2	Cleaning head		

Use the thumb wheel of the cleaning tool to advance the cleaning surface (see Figure 1-8) after cleaning each ferrule so as to ensure a clean section for the next ferrule. The cleaning tool includes an alignment edge and key to help you properly align it with the optical interface surfaces during cleaning.

Figure 1-8 Fujikura IBC Cleaning Tool Head and Alignment Edge



1	Cleaning head	**3**	Key
2	Alignment edge		

Using the Fujikura IBC Cleaning Tool

To operate the cleaning tool, complete the following steps for each ferrule:

Step 1 Attach an ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 Place the proper adapter over the ferrule, as described in this guide. Each type of connector uses a different adapter. The adapter ensures that the cleaning tool is inserted at the correct angle and depth for cleaning.

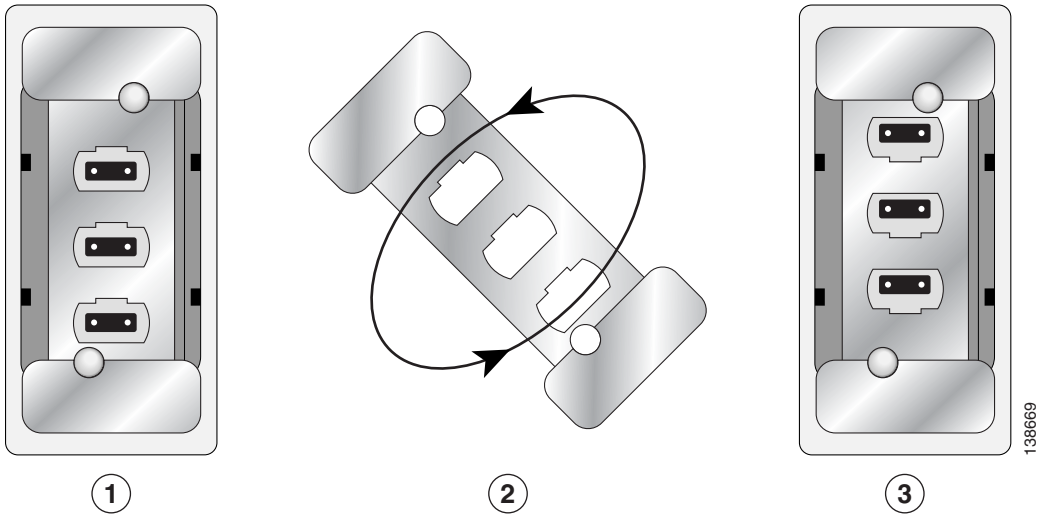
Step 3 Insert the cleaning head into the adapter so that the cleaning surface sits flush against the ferrule. Align the key with the matching notch in the adapter slot.

Step 4 To clean the surface, advance the white thumb wheel until you hear two hard clicks. This action moves a continuous roll of lint-free cleaning cloth across the surface of the fibers, removing dust and other contaminants. The cleaning tool holds enough cloth to clean well over 100 ferrules.

Note The thumb wheel makes a series of soft clicks followed by a "hard click" when turned. The hard click is represented by six large notches along the edge of the thumb wheel. Always advance the thumb wheel until you hear two hard clicks.

Step 5 Rotate the adapter 180 degrees to clean the remaining ferrules, as shown in Figure 1-9.

Figure 1-9 Rotating the Adapter 180 Degrees to Clean All Ferrules



1	Install the adapter and clean the first set of ferrules.	**3**	Install the adapter and clean the remaining ferrules.
2	Rotate the adapter 180 degrees.		

Cleaning the Optical Array Cable Connectors

This chapter provides instructions for cleaning the ferrules in the optical array cable connectors. These connectors are at both ends of the fiber-optic cables that connect the S13 cards in the line card chassis (LCC) to the optical interface modules (OIMs) in the fabric card chassis (FCC).

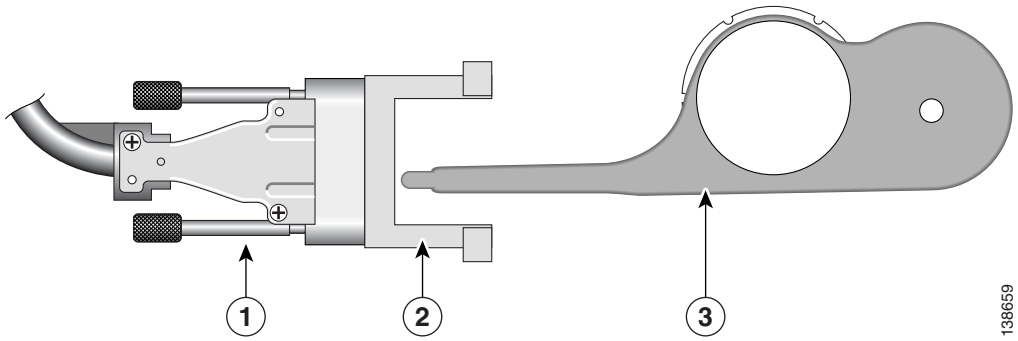
This chapter presents the following topics:

- Information About Cleaning the Optical Array Cable Connectors
- How to Clean the Optical Array Cable Connectors

Information About Cleaning the Optical Array Cable Connectors

The optical array cables interconnect the S2 fabric cards in the LCC with the OIMs in the FCC. To clean the ferrules in the cable connectors, place the OIM/S13 array adapter over each cable connector and insert the cleaning tool, as shown in Figure 2-1.

Figure 2-1 Sample Optical Array Cable Connector, Cleaning Adapter, and Cleaning Tool



1	Optical array cable connector	**3**	Cleaning tool
2	OIM/S13 cleaning adapter		

How to Clean the Optical Array Cable Connectors

Each optical array cable connector contains six optical ferrules. To access all ferrules, you must clean three ferrules and then rotate the adapter 180 degrees to clean the remaining three ferrules. This section describes the process to clean all ferrules in an optical array cable.

Warning **Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.** Statement 125

Warning **Class 1M laser radiation when open. Do not view directly with optical instruments.** Statement 281

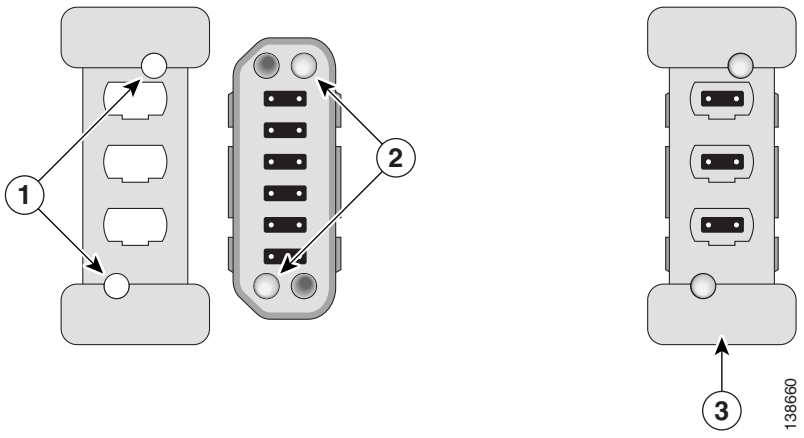
Caution Before you begin, review the "General Reminders and Warnings" section on page 1-2.

To clean the optical array cable connectors, follow these steps:

Step 1 Attach an ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 Attach the adapter, as shown in Figure 2-2. Be sure to align the pins on the cable with the pin holes on the adapter.

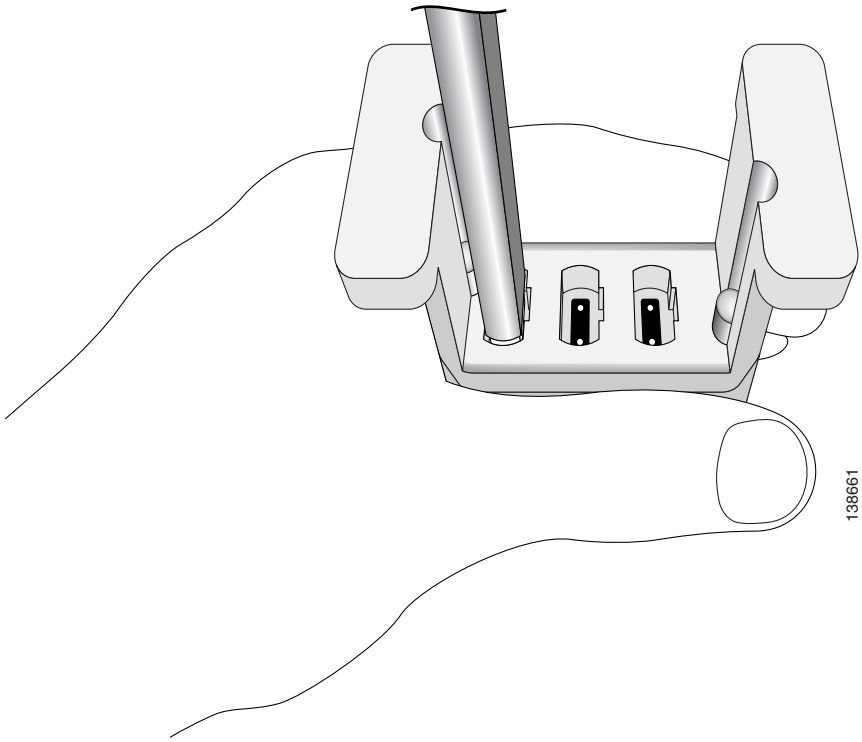
Figure 2-2 Example of Adapter Placement on Array Cable



1	Alignment pin holes on the OIM/S13 array adapter	**3**	Example of an adapter properly installed on an optical array cable
2	Alignment pins on the optical array cable		

Step 3 Wrap your hand around the adapter and trunk array to prevent movement during cleaning.

Figure 2-3 Cleaning an Optical Array Cable Connector



Step 4 Insert the cleaning tool into the first adapter slot. Align the key on the cleaning tool with the matching notch in the adapter slot. The cleaning tool works only when the cleaning head is properly inserted.

Step 5 Advance the thumb wheel until you hear two hard clicks. This advancement ensures that enough lint-free cleaning cloth advances across the face of the fibers in the ferrule.

Note The thumb wheel makes a series of soft clicks followed by a “hard click” when turned. The hard click is represented by six large notches along the edge of the thumb wheel. Always advance the thumb wheel until you hear two hard clicks.

Step 6 Clean the three visible ferrules and then rotate the array adapter 180 degrees to clean the remaining three ferrules.

Step 7 Repeat these steps for all optical array cable connectors that require cleaning.

Note Always keep the protective silver dust end-caps on cable connectors that are not in use.

Cleaning the Bulkhead Array Connectors

This chapter provides instructions for cleaning the optical array connectors located on the S13 cards in the line card chassis (LCC) to the optical interface modules (OIMs) in the fabric card chassis.

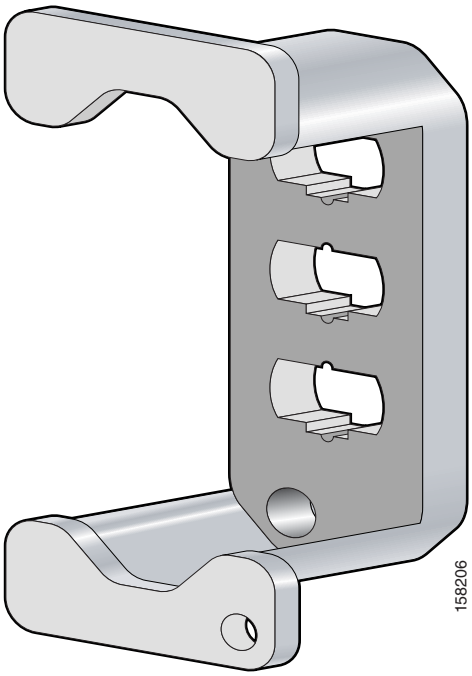
This chapter presents the following topics:

- Information About Cleaning the Bulkead Array Connectors
- How to Clean the Bulkhead Array Connectors

Information About Cleaning the Bulkead Array Connectors

This chapter describes how to clean the S13 array connectors. The bulkhead array connectors are located on the S13 fabric cards in the LCC and on the OIMs in the FCC. Use the OIM/S13 array adapter (see Figure 3-1) to clean these connectors. This adapter is the same one used to clean the optical array cables.

Figure 3-1 OIM/S13 Array Adapter



How to Clean the Bulkhead Array Connectors

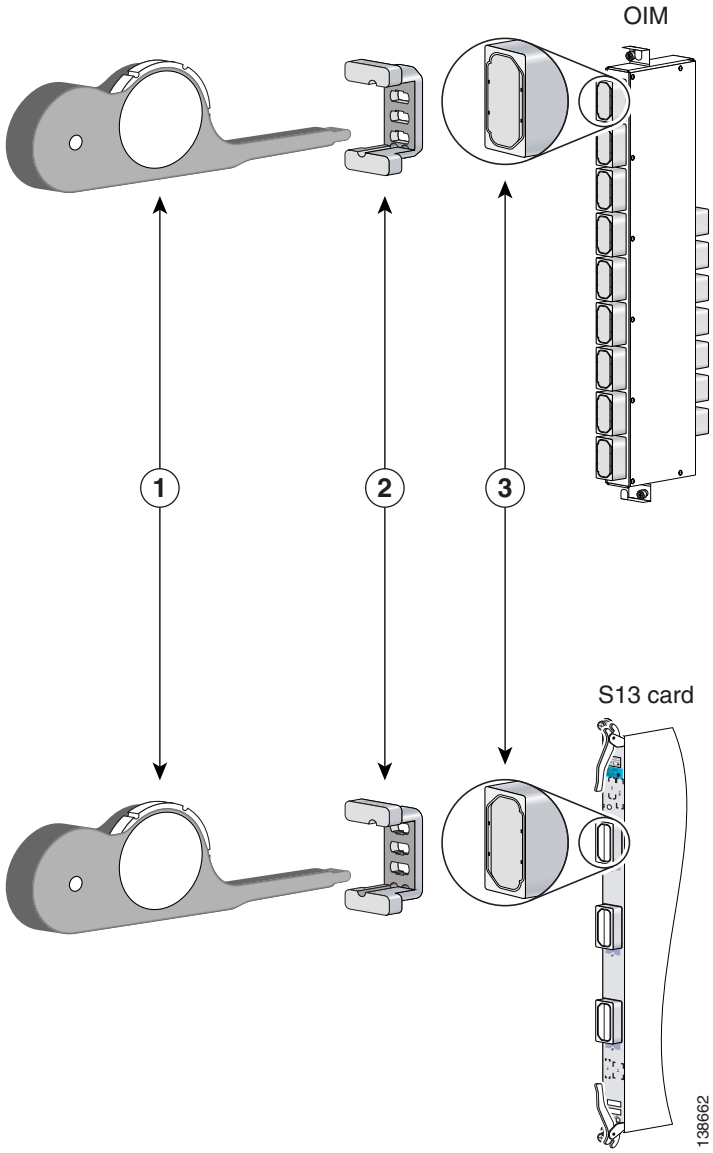
Each bulkhead array connector contains six optical ferrules. To access all ferrules, you must clean three ferrules and then rotate the adapter 180 degrees to clean the remaining three ferrules.

Warning **Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.** Statement 125

Warning **Class 1M laser radiation when open. Do not view directly with optical instruments.** Statement 281

Caution Before you begin, review the "General Reminders and Warnings" section on page 1-2.

Figure 3-2 Cleaning the Bulkhead Array Connectors



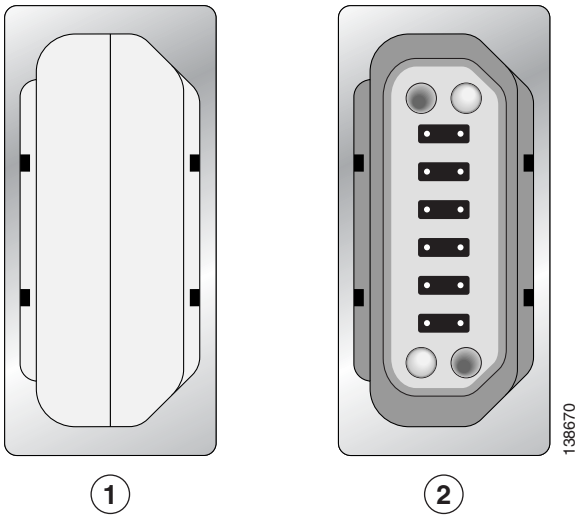
1	Cleaning tool	**3**	Bulkhead array connectors
2	OIM/S13 cleaning adapter		

To clean the bulkhead array connectors, follow these steps:

Step 1 Attach an ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 Insert the array adapter into an array connector. Verify that the connector shutters open fully when you insert the adapter (see Figure 3-3).

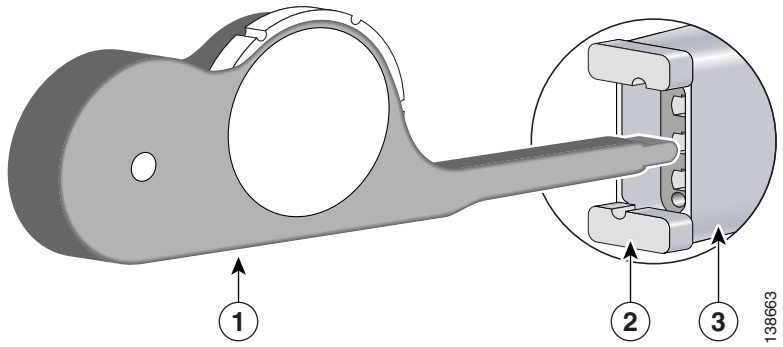
Figure 3-3 Bulkhead Array Connector with Shutters Closed and Open



1	Shutters closed
2	Shutters fully open

Step 3 Insert the cleaning tool into the first adapter slot, as shown in Figure 3-4. Align the key on the cleaning tool with the matching notch in the adapter slot. The cleaning tool works only when the cleaning head is properly inserted.

Figure 3-4 Sample Cleaning Tool, Cleaning Adapter, and Bulkhead Array Connector



1	Cleaning tool	**3**	Bulkhead array connector
2	OIM/S13 array adapter		

Step 4 Advance the thumb wheel until you hear two hard clicks. This advancement ensures that enough lint-free cleaning cloth advances across the face of the fibers in the ferrule.

Note The thumb wheel makes a series of soft clicks followed by a “hard click” when turned. The hard click is represented by six large notches along the edge of the thumb wheel. Always advance the thumb wheel until you hear two hard clicks.

Step 5 Clean the three visible ferrules and then rotate the array adapter 180 degrees to clean the remaining three ferrules.

Step 6 Repeat these steps for all bulkhead array connectors that require cleaning. The bulkhead array connectors are located in the S13 and OIMs, as shown in Figure 3-2.

Cleaning the S2 HBMT Connectors

This chapter provides instructions for cleaning the high-density backplane-mounted (HBMT) connectors on the rear of the S2 cards in the fabric card chassis.

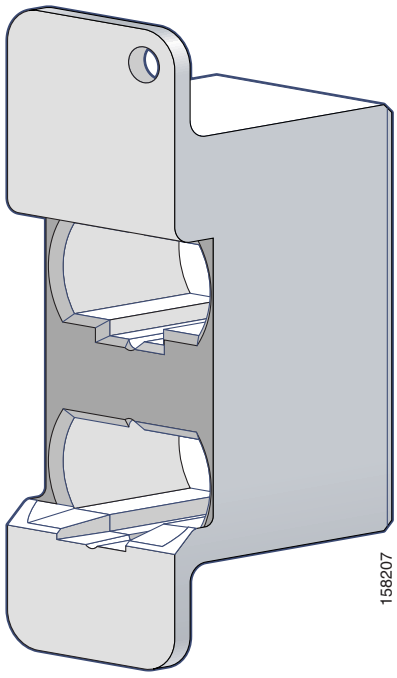
This chapter presents the following topics:

- Information About Cleaning the S2 HBMT Connectors
- Cleaning the S2 HBMT Connectors

Information About Cleaning the S2 HBMT Connectors

In the fabric card chassis (FCC), the S2 and OIMs connect to each other using HBMT connectors on the back of each card. Use the S2 HBMT adapter (see Figure 4-1) to clean these connectors.

Figure 4-1 S2 HBMT Adapter



Cleaning the S2 HBMT Connectors

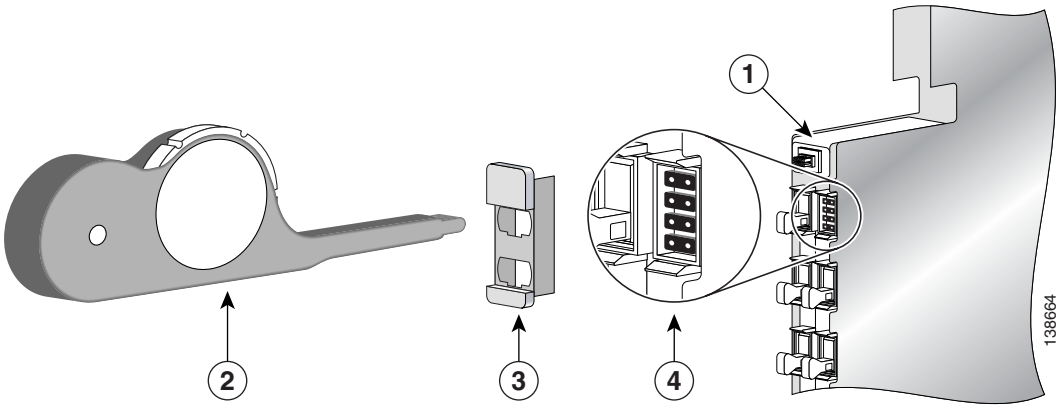
Each S2 HBMT connector contains four optical ferrules. To access all ferrules, you must clean two ferrules and then rotate the adapter 180 degrees to clean the remaining two ferrules, as described in the following steps:

Warning **Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.** Statement 125

Warning **Class 1M laser radiation when open. Do not view directly with optical instruments.** Statement 281

Caution Before you begin, review the "General Reminders and Warnings" section on page 1-2.

Figure 4-2 Cleaning the S2 HBMT Connectors



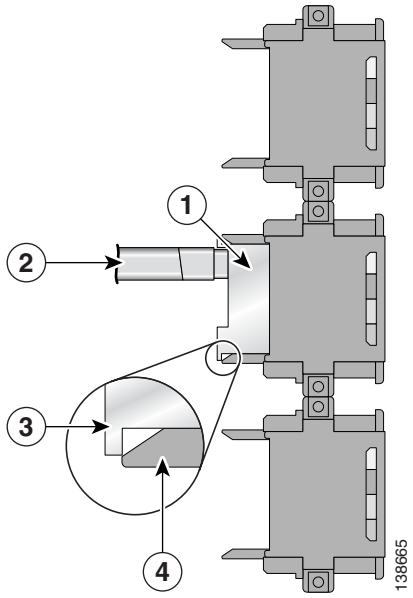
1	S2 fabric card	**3**	S2 HBMT adapter
2	Cleaning tool	**4**	S2 HBMT connector

To clean the S2 HBMT connectors, follow these steps:

Step 1 Attach an ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 Insert the S2 HBMT adapter all the way into the connector. The metal tabs on the sides of adapter should contact the plastic latches on the sides of the connector, as shown in Figure 4-3.

Figure 4-3 Sample Cleaning Adapter, Cleaning Tool, and S2 HBMT Connector



1	S2 HBMT adapter	**3**	Metal tabs on adapter
2	Cleaning tool	**4**	Plastic latches on connector

Step 3 Insert the cleaning tool into the first adapter slot. Align the key on the cleaning tool with the matching notch in the adapter slot. The cleaning tool works properly only when the cleaning head is properly inserted.

Step 4 Advance the thumb wheel until you hear two hard clicks. This advancement ensures that enough lint-free cleaning cloth advances across the face of the fibers in the ferrule.

Note The thumb wheel makes a series of soft clicks followed by a "hard click" when turned. The hard click is represented by six large notches along the edge of the thumb wheel. Always advance the thumb wheel until you hear two hard clicks.

Step 5 Clean the two visible ferrules and then rotate the array adapter 180 degrees to clean the remaining two ferrules.

Step 6 Repeat these steps for all S2 HBMT connectors that require cleaning.

Cleaning the OIM HBMT Connectors

This chapter provides instructions for cleaning the high-density backplane-mounted (HBMT) connectors on the rear of the S2 cards in the fabric card chassis.

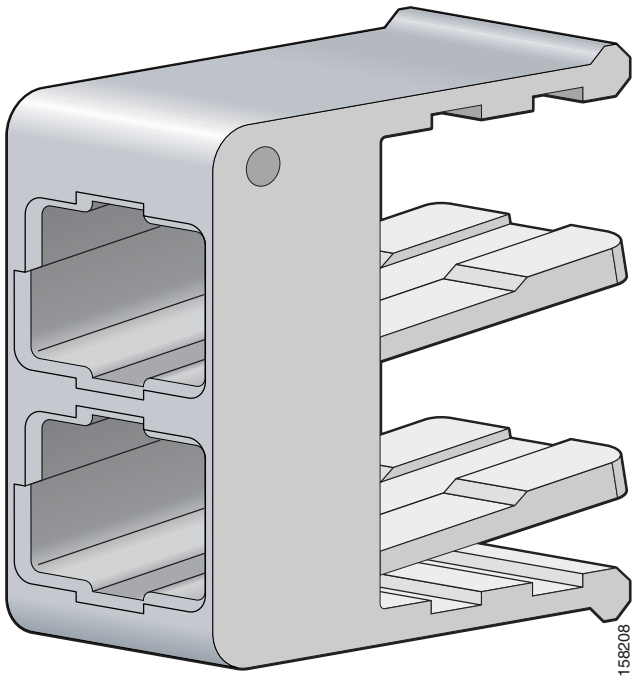
This chapter presents the following topics:

- Information About Cleaning the OIM HBMT Connectors
- How to Clean the OIM HBMT Connectors

Information About Cleaning the OIM HBMT Connectors

This chapter describes how to clean the OIM HBMT connectors. In the fabric card chassis (FCC), the S2 and OIMs connect to each other using HBMT connectors located on the back of each card. Use the OIM HBMT adapter (see Figure 5-1) to clean these connectors.

Figure 5-1 OIM HBMT Adapter



How to Clean the OIM HBMT Connectors

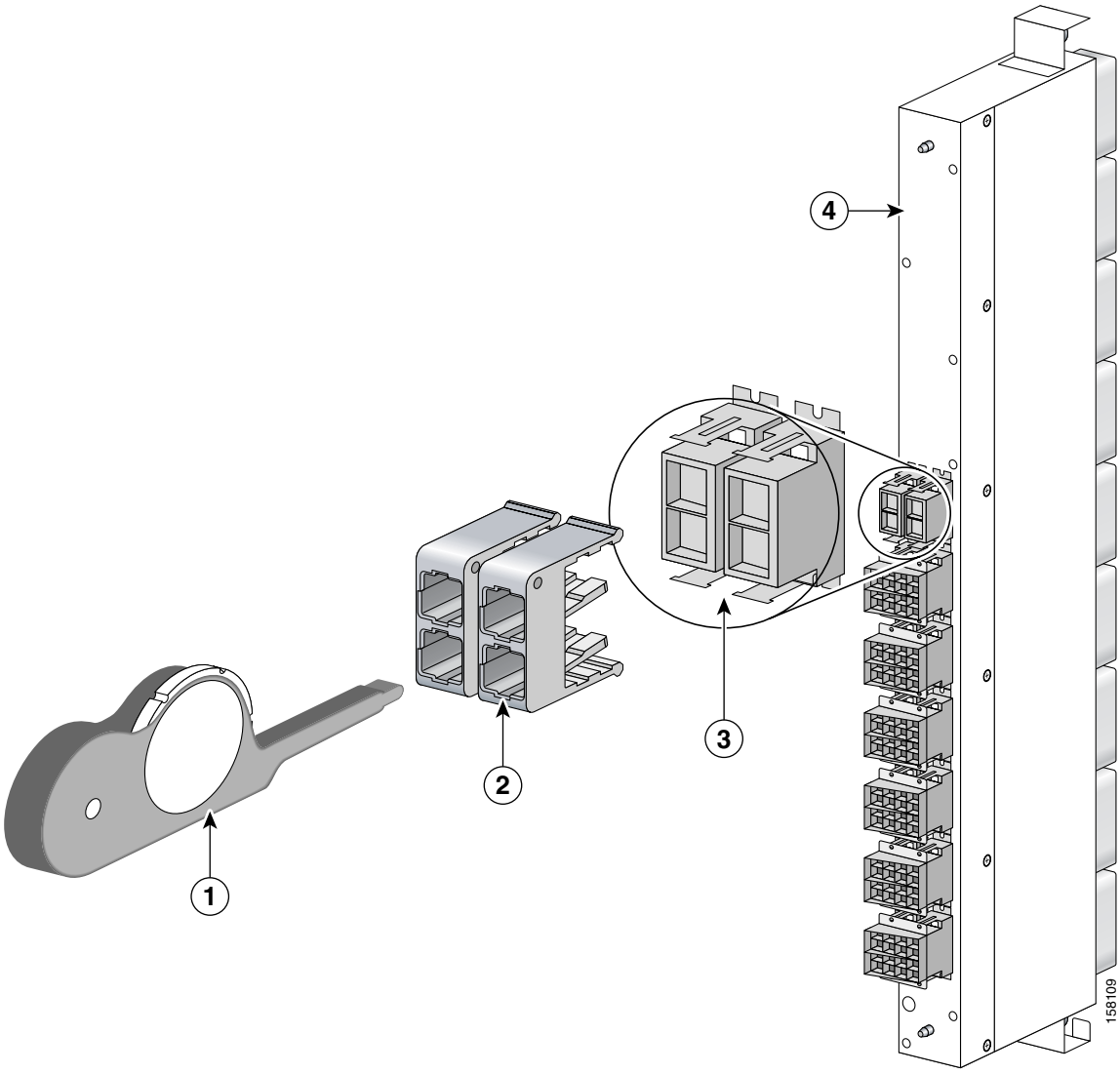
Each OIM HBMT connector contains four optical ferrules. To access all ferrules, you must clean two ferrules and then rotate the adapter 180 degrees to clean the remaining two ferrules.

Warning **Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.** Statement 125

Warning **Class 1M laser radiation when open. Do not view directly with optical instruments.** Statement 281

Caution Before you begin, review the "General Reminders and Warnings" section on page 1-2.

Figure 5-2 Cleaning the OIM HBMT Connectors



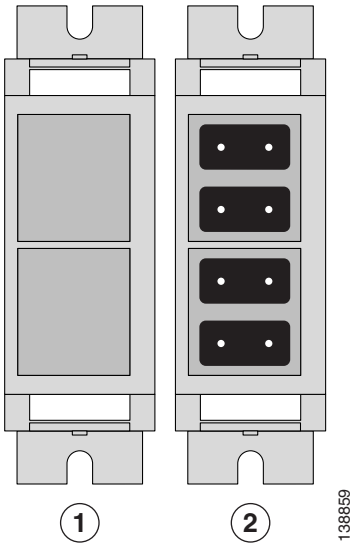
1	Cleaning tool	**3**	OIM HBMT connector
2	OIM HBMT adapter	**4**	OIM

To clean the OIM HBMT connectors, follow these steps:

Step 1 Attach an ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket or a bare metal surface on the chassis.

Step 2 Insert the OIM HBMT adapter into an OIM HBMT connector. Verify that the connector shutters open fully when you insert the adapter (see Figure 5-3).

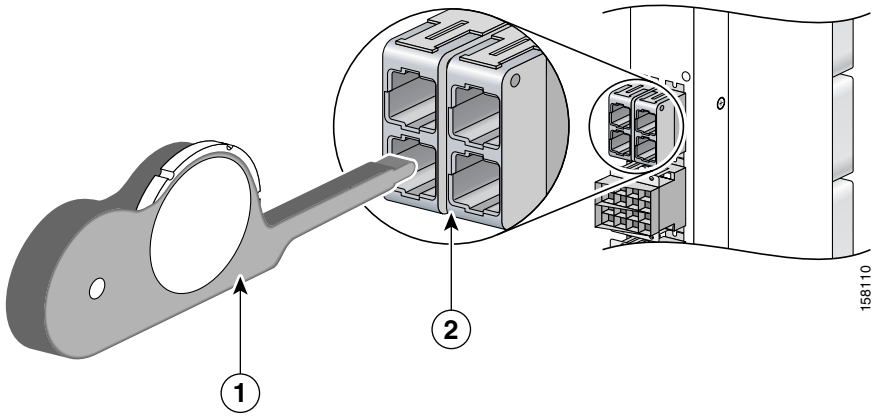
Figure 5-3 OIM HBMT Connector with Shutters Closed and Open



1	Shutters closed
2	Shutters fully open

Step 3 Insert the cleaning tool into the first adapter slot, as shown in Figure 5-4. Align the key on the cleaning tool with the matching notch in the adapter slot. The cleaning tool works only when the cleaning head is properly inserted.

Figure 5-4 Sample Cleaning Tool, Cleaning Adapter, and OIM HBMT Connector



1	Cleaning tool	2	OIM HBMT adapter

Step 4 Advance the thumb wheel until you hear two hard clicks. This advancement ensures that enough lint-free cleaning cloth advances across the face of the fibers in the ferrule.

Note The thumb wheel makes a series of soft clicks followed by a "hard click" when turned. The hard click is represented by six large notches along the edge of the thumb wheel. Always advance the thumb wheel until you hear two hard clicks.

Step 5 Clean the first two ferrules and then rotate the adapter to clean the remaining two ferrules.

Step 6 Repeat these steps for all OIM HBMT connectors that require cleaning.

A

adapter
- OIM HBMT (figure) 1-7, 5-1
- rotating 180 degrees 1-10
- S2 HBMT (figure) 1-6, 4-1

adapter placement example (figure) 2-2

array adapter
- OIM/S13 (figure) 1-6, 3-1

array connectors, cleaning optical 2-1, 2-2

B

bulkhead array connectors
- cleaning 3-1
- cleaning (figure) 3-3
- how to clean 3-2
- information about cleaning 3-1
- shutters open and closed (figure) 3-4

C

cleaning
- bulkhead array connectors 3-1, 3-2
- bulkhead array connectors (figure) 3-3
- information about optical array connectors 2-1
- OIM HBMT connectors 5-1, 5-2
- optical array cable connector (figure) 2-3
- overview of 1-1
- S2 HBMT connectors 4-1, 4-2

cleaning kit
- about 1-5
- contents of 1-5

cleaning the OIM HBMT connectors (figure) 5-3

cleaning the optical array connectors 2-1

cleaning the S2 HBMT connectors (figure) 4-2

cleaning tool
- description of 1-7
- Fujikura IBC 1-7
- Fujikura IBC head 1-9
- using 1-9

cleaning tool (figure) 1-5, 1-8, 2-1, 3-4, 4-3, 5-4

connectors
- cleaning bulkhead array 3-1, 3-2
- cleaning OIM HBMT 5-1, 5-2
- cleaning OIM HBMT, information about 5-1
- cleaning S2 HBMT 4-1, 4-2
- cleaning S2 HBMT, information about 4-1
- fiber optic 1-2
- in a multishelf system 1-2
- information about cleaning bulkhead array 3-1

conventions, document vi

D

document
- conventions vi
- objective v
- organization vi

documentation
- related vii

E

example of adapter placement (figure) 2-2

F

fiber-optic cleaning kit, about the 1-5
fiber-optic connections in an FCC (figure) 1-3
fiber-optic connections in an LCC (figure) 1-4
fiber optics
  connections in an FCC (figure) 1-3
  connections in an LCC (figure) 1-4
  connectors in a multishelf system 1-2
  inspection of 1-1
  overview of cleaning 1-1
Figures
  adapter
    placement example 2-2
  bulkhead array connector with shutters open and closed 3-4
  cleaning adapter 2-1, 3-4, 4-3, 5-4
  cleaning an optical array cable connector 2-3
  cleaning the bulkhead array connectors 3-3
  cleaning the OIM HBMT connectors 5-3
  cleaning the S2 HBMT connectors 4-2
  cleaning tool 2-1, 3-4, 4-3, 5-4
  example of adapter placement 2-2
  fiber-optic connections in an FCC 1-3
  fiber-optic connections in an LCC 1-4
  Fujikura IBC cleaning tool 1-5, 1-8
  Fujikura IBC cleaning tool head 1-9
  OIM/S13 array adapter 1-6, 3-1
  OIM HBMT adapter 1-7, 5-1
  OIM HBMT array connector 5-4
  OIM HBMT connector with shutters open and closed 5-4
  rotating the adapter 180 degrees 1-10
  S2 HBMT adapter 1-6, 4-1
  sample bulkhead array connector 3-4
  sample optical array cable connector 2-1
  sample S2 HBMT connector 4-3
Fujikura IBC cleaning tool
  description of 1-7
Fujikura IBC cleaning tool (figure) 1-5, 1-8
Fujikura IBC cleaning tool head (figure) 1-9

G

general reminders and warnings 1-2

H

how to clean the optical array connectors 2-2

I

inspection of fiber optics 1-1

M

multishelf system, fiber-optic connectors 1-2

O

OIM/S13 array adapter (figure) 1-6, 3-1
OIM HBMT adapter (figure) 1-7, 5-1
OIM HBMT connector
  shutters open and closed (figure) 5-4
OIM HBMT connectors
  cleaning 5-1, 5-2
  cleaning (figure) 5-3
  information about cleaning 5-1
optical array cable connectors
  cleaning (figure) 2-3
optical array connectors
  cleaning 2-1
  how to clean 2-2
  information about cleaning 2-1
organization, document vi
overview of fiber optical cleaning 1-1

R

related documentation vii
reminders, general 1-2
rotating the adapter 180 degrees (figure) 1-10

S

S2 HBMT adapter (figure) 1-6, 4-1
S2 HBMT connector (figure) 4-3
S2 HBMT connectors
  cleaning 4-1, 4-2
  information about cleaning 4-1
S2 HBMT connectors, cleaning (figure) 4-2
sample bulkhead array connector (figure) 3-4
sample OIM HBMT connector (figure) 5-4
sample optical array cable connector (figure) 2-1

W

warnings
  description (and translations) of vi
warnings, general 1-2